

INVERSE COMPLEX FILTER

- 1) Photograph the Fourier transform of the aberrated impulse response and process to $\gamma = 1$

$$D = \log \varepsilon^\gamma \approx \log I^\gamma$$

$$T_I = e^{-D} = I^{-\gamma}$$

$$T_A = I^{-\gamma/2}$$

$I(x)$ = impulse response

$$T(\mu) = \text{transfer function} = \int_{-\infty}^{\infty} I(x) e^{i \frac{2\pi \mu x}{\lambda f}} dx$$

$$T_A = |T|^{-\gamma}$$

$$\gamma = +1$$

$$T_A = 1/|T(\mu)|$$

- 2) Place this amplitude transmittance in the hologram system such that, in the formation of the hologram, we have

$$T_A = \left[\frac{1}{|T(\mu)|} (e^{i\alpha} + T(\mu)) \right]^{2(\frac{\gamma}{2})} = \left[\left(\frac{e^{i\alpha}}{|T(\mu)|} + \frac{T(\mu)}{|T(\mu)|} \right)^2 \right]^{-\gamma/2}$$

for $\gamma = -2$

$$T_A = \underbrace{\frac{1}{|T(\mu)|^2}}_{\text{D.C.}} + \underbrace{1}_{\text{D.C.}} + \underbrace{\frac{e^{-i\alpha} T(\mu)}{|T(\mu)|^2}}_{\text{D.C.}} + \underbrace{\frac{e^{i\alpha} T^*(\mu)}{|T(\mu)|^2}}_{\text{D.C.}}$$

$$|P(\mu)|^2 = P(\mu) P^*(\mu)$$

∴ at the e^{ix} term we have

$$T_A \approx \frac{e^{ix}}{P(\mu)}, \text{ the inverse complex filter.}$$

- We now both the hologram term $e^{ix} P^*(\mu)$ and the inverse amp. squared $1/P(\mu)^2$ on one piece of film. The primary advantage may be the possibility of recording the high carrier frequency at high contrast because the filter now utilizes a smaller dynamic range of the film.

25X1

2/1/67